**COMSATS University Islamabad**

**Department of Statistics**

**QUIZ 4**

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| Course Title: | Statistics and Probability Theory | | | | Course Code: | | MTH262 | |  | 3(3,0) |
| Name & Reg. | Programme Name: | | | | | | Maxime Time: 60 Minutes | | | |
| Semester: | SP23 | Batch: | BCS- | Section: | |  | Dated | 10-06-23 | | |
| Instruction: | Present all necessary calculations. | | | | | Marks | | 30 | | |

**Question 1: (10)**

In a biomedical study with rats, a dose-response investigation is used to determine the effect of the dose of a toxicant on their survival time. The toxicant is one that is frequently discharged into the atmosphere from jet fuel. For a certain dose of the toxicant, the study determines that the survival time, in weeks, has a Gamma distribution having

1. What is the probability that a rat survives no longer than 60 weeks?
2. What is the probability that a rat survives more than 40 weeks?
3. What is the probability that a rat survives from 50 to 80 weeks?
4. If there are 20 mice included in the experiment, how many would survive the period mentioned in a, b, and c parts?

**Question 2: (10)**

The average lifetime of a certain type of small motor is 10 years with a standard deviation of 2 years. Assume that the lifetime of the motors follows a normal probability distribution. Then

1. What is the probability that a randomly selected motor will survive for less than 8 years?
2. What is the probability that a randomly selected motor will survive for more than 15 years?
3. What is the probability that a randomly selected motor will survive from 7 to 13 years?
4. If the manufacturer replaces free all motors that fail while under guarantee. If he is willing to replace only 3% of the motors that fail, how long a guarantee should he offer?
5. What is the lifetime beyond which only 10% of motors survive?

**Question 3: (10)**

One-fourth of the male freshmen entering a large state school are out-of-state students. If the students are assigned at random to dormitories, 200 to a building;

1. What is the probability that in a given dormitory at least one-fifth of the students are from out of state?
2. What is the probability that in a given dormitory at from 45 to 65 of the students are from out of state?